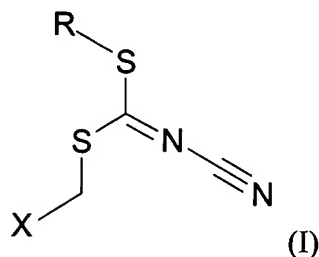


THE CLAIMED INVENTION IS:

1. A method for controlling the growth of at least one fungus on a tanned hide comprising the step of contacting a hide prior to, during and after tanning with a cyanodithiocarbamate of formula (I):



X is a halogen;

R is a substituted or unsubstituted C₁-C₁₄ alkyl group, a substituted or unsubstituted C₂-C₁₄ alkenyl group, a substituted or unsubstituted C₂-C₁₄ alkynyl group, a substituted or unsubstituted group defined by Y-Ar-(CH₂)_m- or by Z-(CH₂)_n;

Ar is a substituted or unsubstituted aryl group selected from phenyl, and naphthyl;

Y is H, halogen, NO₂, R¹, R¹O, or R¹R²N;

Z is NC, R¹O, R¹OC(O), or R¹OCH₂CH₂(OCH₂CH₂)_p

m ranges from 0 to 3;

n ranges from 0 to 3;

p ranges from 0 to 3; and

R¹ and R² are independently H, substituted or unsubstituted C₁-C₅ alkyl;

in an amount effective to control the growth of at least one fungus on the tanned hide.

2. A method of claim 1, wherein:

X is Cl, Br, or I;

R is a substituted or unsubstituted C₁-C₇ alkyl group, a substituted or unsubstituted C₂-C₇ alkenyl group, a substituted or unsubstituted group defined by Y-Ar-(CH₂)_m- or by Z-(CH₂)_n;

Ar is phenyl;

Y is H, Cl, Br, I, NO₂, R¹, R¹O, or R¹R²N;

Z is NC, R¹O, R¹OC(O), or R¹OCH₂CH₂(OCH₂CH₂)_p

m is 0 or 1; and

R^1 and R^2 are independently H, methyl, or ethyl.

3. A method of claim 1, wherein

X is Cl and R is $-\text{CH}_3$, $-(\text{CH}_2)_2\text{CH}_3$, $-(\text{CH}_2)_3\text{CH}_3$, $-(\text{CH}_2)_5\text{CH}_3$, $-(\text{CH}_2)_7\text{CH}_3$, $-(\text{CH}_2)_{11}\text{CH}_3$, $-\text{CH}(\text{CH}_3)_2$, $-\text{CH}(\text{CH}_3)(\text{CH}_2)_3\text{CH}_3$, $-(\text{CH}_2)_2\text{OH}$, $-(\text{CH}_2)_3\text{OH}$, $-(\text{CH}_2\text{CH}_2\text{O})_2\text{CH}_2\text{CH}_2\text{OH}$, $-(\text{CH}_2)_2\text{CO}_2\text{H}$, $-\text{CH}_2\text{CH}_2\text{CN}$, $-\text{CH}_2\text{CH}=\text{CH}_2$, or $\text{CH}_2\text{C}_6\text{H}_5$;

X is Br and R is $-(\text{CH}_2)_3\text{CH}_3$, or $-\text{CH}_2\text{C}_6\text{H}_5$; or

X is I and R is $-(\text{CH}_2)_3\text{CH}_3$, or $-\text{CH}_2\text{C}_6\text{H}_5$.

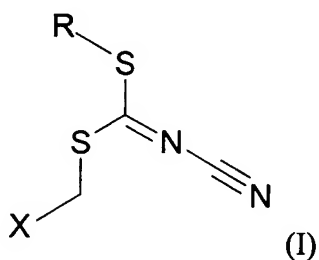
4. A method of claim 1, wherein the cyanodithiocarbamate of formula (I) is hexyl chloromethyl cyanodithiocarbamate.

5. A method of claim 1, wherein the leather substrate is a wet blue hide a wet white hide, a vegetable-tanned hide or an oil-tanned hide.

6. A method of claim 3, wherein the leather substrate is a wet blue hide a wet white hide, a vegetable-tanned hide or an oil-tanned hide.

7. A method of claim 4, wherein the leather substrate is a wet blue hide a wet white hide, a vegetable-tanned hide or an oil-tanned hide.

8. A method for controlling the growth of microorganisms on a hide during a leather tanning process comprising the step of contacting a hide susceptible to fungal growth with a tanning liquor containing a cyanodithiocarbamate of formula (I):



X is a halogen

R is a substituted or unsubstituted C_1 - C_{14} alkyl group, a substituted or unsubstituted C_2 - C_{14} alkenyl group, a substituted or unsubstituted C_2 - C_{14} alkynyl group, a substituted or unsubstituted group defined by $\text{Y-Ar}-(\text{CH}_2)_m-$ or by $\text{Z}-(\text{CH}_2)_n-$;

Ar is a substituted or unsubstituted aryl group selected from phenyl, and naphthyl;

Y is H, halogen, NO₂, R¹, R¹O, or R¹R²N;

Z is NC, R¹O, R¹OC(O), or R¹OCH₂CH₂(OCH₂CH₂)_p

m ranges from 0 to 3;

n ranges from 0 to 3;

p ranges from 0 to 3; and

R¹ and R² are independently H, substituted or unsubstituted C₁-C₅ alkyl;

in an amount effective to control the growth of at least one fungus on the hide.

9. A method of claim 8, wherein

R is a substituted or unsubstituted C₁-C₇ alkyl group, a substituted or unsubstituted C₂-C₇ alkenyl group, a substituted or unsubstituted group defined by Y-Ar-(CH₂)_m- or by Z-(CH₂)_n;

Ar is phenyl;

Y is H, Cl, Br, I, NO₂, R¹, R¹O, or R¹R²N;

Z is NC, R¹O, R¹OC(O), or R¹OCH₂CH₂(OCH₂CH₂)_p

m is 0 or 1; and

R¹ and R² are independently H, methyl, or ethyl.

10. A method of claim 8, wherein

X is Cl and R is -CH₃, -(CH₂)₂CH₃, -(CH₂)₃CH₃, -(CH₂)₅CH₃, -(CH₂)₇CH₃, -(CH₂)₁₁CH₃, -CH(CH₃)₂, -CH(CH₃)(CH₂)₃CH₃, -(CH₂)₂OH, -(CH₂)₃OH, -(CH₂CH₂O)₂CH₂CH₂OH, -(CH₂)₂CO₂H, -CH₂CH₂CN, -CH₂CH=CH₂, or -CH₂C₆H₅;

X is Br and R is -(CH₂)₃CH₃, or -CH₂C₆H₅; or

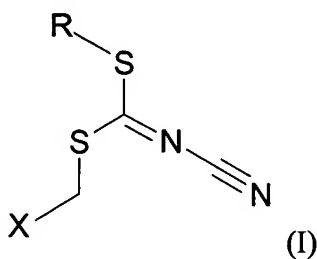
X is I and R is -(CH₂)₃CH₃, or -CH₂C₆H₅.

11. A method of claim 8, wherein the cyanodithiocarbamate of formula (I) is hexyl chloromethyl cyanodithiocarbamate.

12. A method of claim 8, wherein the hide is a wet blue hide, a wet white hide, a vegetable-tanned hide or an oil-tanned hide.

13. A method of claim 10, wherein the hide is a wet blue hide, a wet white hide, a vegetable-tanned hide or an oil-tanned hide.

14. A method of claim 11, wherein the hide is a wet blue hide, a wet white hide, a vegetable-tanned hide or an oil-tanned hide.
15. A method of claim 8, wherein the tanning liquor is a pickling liquor.
16. A method of claim 8, wherein the cyanodithiocarbamate of formula (I) is present in the tanning liquor in an amount ranging from about 5 to about 500 parts per million.
17. A liquor for use in a leather-tanning process comprising a cyanodithiocarbamate of formula (I):



X is a halogen;

R is a substituted or unsubstituted C_1 - C_{14} alkyl group, a substituted or unsubstituted C_2 - C_{14} alkenyl group, a substituted or unsubstituted C_2 - C_{14} alkynyl group, a substituted or unsubstituted group defined by $Y-Ar-(CH_2)_m-$ or by $Z-(CH_2)_n-$;

Ar is a substituted or unsubstituted aryl group selected from phenyl, and naphthyl;

Y is H, halogen, NO_2 , R^1 , R^1O , or R^1R^2N ;

Z is NC , R^1O , $R^1OC(O)$, or $R^1OCH_2CH_2(OCH_2CH_2)_p$;

m ranges from 0 to 3;

n ranges from 0 to 3;

p ranges from 0 to 3; and

R^1 and R^2 are independently H, substituted or unsubstituted C_1 - C_5 alkyl.

18. A liquor of claim 17, wherein

R is a substituted or unsubstituted C_1 - C_7 alkyl group, a substituted or unsubstituted C_2 - C_7 alkenyl group, a substituted or unsubstituted group defined by $Y-Ar-(CH_2)_m-$ or by $Z-(CH_2)_n-$;

Ar is phenyl;

Y is H, Cl, Br, I, NO_2 , R^1 , R^1O , or R^1R^2N ;

Z is NC, R¹O, R¹OC(O), or R¹OCH₂CH₂(OCH₂CH₂)_p

m is 0 or 1; and

R¹ and R² are independently H, methyl, or ethyl.

19. A liquor of claim 17, wherein

X is Cl and R is -CH₃, -(CH₂)₂CH₃, -(CH₂)₃CH₃, -(CH₂)₅CH₃, -(CH₂)₇CH₃, (CH₂)₁₁CH₃, -CH(CH₃)₂, -CH(CH₃)(CH₂)₃CH₃, -(CH₂)₂OH, -(CH₂)₃OH, -(CH₂CH₂O)₂CH₂CH₂OH, -(CH₂)₂CO₂H, -CH₂CH₂CN, -CH₂CH=CH₂, or -CH₂C₆H₅;

X is Br and R is -(CH₂)₃CH₃, or -CH₂C₆H₅; or

X is I and R is -(CH₂)₃CH₃, or CH₂C₆H₅.

20. A liquor of claim 17, wherein the cyanodithiocarbamate of formula (I) is hexyl chloromethyl cyanodithiocarbamate.

21. A liquor according to claim 17, wherein the liquor is selected from a pickling liquor, a chrome-tanning liquor, a white-tanning liquor, a vegetable-tanning liquor, an oil-tanning liquor, a post-tan washing liquor, a retanning liquor, a dye liquor, and a fatliquor; and wherein the microorganism is algae, fungi, or bacteria; and the cyanodithiocarbamate of formula (I) is present in the tanning liquor in an amount ranging from about 5 to about 500 parts per million.

22. A liquor according to claim 19, wherein the liquor is selected from a pickling liquor, a chrome-tanning liquor, a white-tanning liquor, a vegetable-tanning liquor, an oil-tanning liquor, a post-tan washing liquor, a retanning liquor, a dye liquor, and a fatliquor; and wherein the microorganism is algae, fungi, or bacteria; and the cyanodithiocarbamate of formula (I) is present in the tanning liquor in an amount ranging from about 5 to about 500 parts per million.

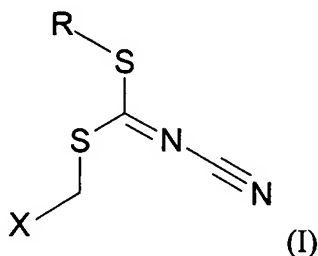
23. A liquor according to claim 20, wherein the liquor is selected from a pickling liquor, a chrome-tanning liquor, a white-tanning liquor, a vegetable-tanning liquor, an oil-tanning liquor, a post-tan washing liquor, a retanning liquor, a dye liquor, and a fatliquor; and wherein the microorganism is algae, fungi, or bacteria; and the cyanodithiocarbamate of formula (I) is present in the tanning liquor in an amount ranging from about 5 to about 500 parts per million.

24. A liquor of claim 21, wherein the liquor is a pickling liquor.

25. A liquor of claim 23, wherein the liquor is a pickling liquor.

26. A liquor of claim 17, further comprising a solvent selected from methyl ethers of glycols, M-pyrol, and petroleum distillates; and a diluent selected from soybean oil, pine tree oil, cottonseed oil, corn oil, canola oil, peanut oil, palm oil, rice oil, olive oil, tung nut oil, castor bean oil, linseed oil, citrus oil, and datenut oil.

27. A cyanodithiocarbimate of formula (I):



X is a halogen;

R is a substituted or unsubstituted C₄-C₁₄ alkyl group, a substituted or unsubstituted C₂-C₁₄ alkenyl group with the proviso that it is not -CH₂CHCH₂, a substituted or unsubstituted C₂-C₁₄ alkynyl group, a substituted or unsubstituted group defined by Y-Ar-(CH₂)_m- or by Z-(CH₂)_n;

Ar is a substituted or unsubstituted aryl group selected from phenyl, and naphthyl;

Y is H, halogen, NO₂, R¹, R¹O, R¹R²N;

Z is NC, R¹O, R¹OC(O), R¹OCH₂CH₂(OCH₂CH₂)_p

m is 0, 2, or 3;

n ranges from 0 to 3;

p ranges from 0 to 3; and

R¹ and R² are independently H, substituted or unsubstituted C₁-C₅ alkyl.

28. A cyanodithiocarbimate of claim 27, wherein

R is a substituted or unsubstituted C₅-C₇ alkyl group, a substituted or unsubstituted C₂-C₇ alkenyl group with the proviso that it is not -CH₂CH=CH₂, a substituted or unsubstituted group defined by Y-Ar-(CH₂)_m- or by Z-(CH₂)_n;

Ar is phenyl;

Y is H, Cl, Br, I, NO₂, R¹, R¹O, or R¹R²N;

Z is NC, R^1O , $R^1OC(O)$, or $R^1OCH_2CH_2(OCH_2CH_2)_p$

m is 0; and

R^1 and R^2 are independently H, methyl, or ethyl.

29. A cyanodithiocarbamate of claim 27, wherein

X is Cl and R is $-(CH_2)_5CH_3$, $-(CH_2)_7CH_3$, $-(CH_2)_{11}CH_3$, $-(CH_2)CH(CH_3)_2$, $-CH(CH_3)(CH_2)_3CH_3$, $-(CH_2)_2OH$, $-(CH_2)_3OH$, $-(CH_2CH_2O)_2CH_2CH_2OH$, $-(CH_2)_2CO_2H$, $-CH_2CH_2CN$, $-CH_2C_6H_5$;

X is Br and R is $-(CH_2)_3CH_3$, or $-CH_2C_6H_5$; or

X is I and R is $-(CH_2)_3CH_3$, or $CH_2C_6H_5$.

30. Hexyl chloromethyl cyanodithiocarbamate.